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Traffic safety climate attitudes of road users in Germany

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ABSTRACT

This paper validates traffic safety climate attitudes based on a representative sample of road users of all travel modes. We use the German version of the Traffic Climate Scale (TCS) which was applied in a large-scale road safety survey in 2010. A total of 1680 people were surveyed. The sample is representative for socio-demographic characteristics and travel mode choice in Germany. Factor analysis reveals a three-factor structure of traffic safety climate with the factor 'External affective demands' describing emotional engagement in traffic, the factor 'Internal requirements' representing individual skills and abilities to successfully participate in traffic, and the factor 'Functionality' describing requirements for a functional traffic system. The less emotionally demanding and the more functional traffic is perceived to be, the safer people feel in traffic. External affective demands are consistently related to the perception of others' driving/riding style but not to one's own, whereas internal requirements are consistently related to one's own driving/riding style but not to the perception of others. There is no relation between traffic safety climate and accidents or near accidents. Contrary to our expectations, a positive traffic safety climate is associated with more secondary tasks while driving and traffic violations. Behavioural control beliefs may mediate the traffic climate–traffic behaviour relationship. The results are discussed with reference to attitude research and the theory of planned behaviour in particular.

1. Introduction

Recent efforts in road safety research are aimed at changing the overall way of thinking about road safety (AAA Foundation for Traffic Safety, 2007). The starting point is the understanding that current road safety practices such as legal, technical and infrastructure measures alone will not guarantee further progress in reducing accidents and fatalities (Ward, Linkenbach, Keller, & Otto, 2010).

An alternative approach to road safety is to include concepts like traffic safety culture and traffic safety climate as documented by this special issue. The concepts of safety culture and climate have only recently been applied to road traffic. Traffic safety culture is defined as "the sum of all factors that affect skills, attitudes, and behaviours of drivers as well as vehicles and infrastructure" (Leviakangas, 1998). It can be described as shared underlying core values and beliefs about appropriate safety behaviour. Safety culture is believed to have a surface component which is described as safety climate (Cheyne, Cox, Oliver, & Tomás, 1998; Mearns, Flin, Gordon, & Fleming, 1998; Ostroff, Kinicki, & Muhammad, 2013). Özkan and Lajunen (2011, chap. 14) define traffic safety climate as "the road users' (e.g. drivers') attitudes and perceptions of the traffic in a context (e.g. country) at a given point in time". It reflects the perception of the actual situation in terms of practices, policies,

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procedures, routines and sanctions. So far the conceptualisation and empirical evidence of traffic safety climate is based on vehicle traffic only (AAA Foundation for Traffic Safety, 2007) and professional drivers in particular (Nævestad & Bjørnskau, 2012). Thus, the results are not necessarily valid for the road user population at large. Therefore, the aim of this paper is to measure and to validate traffic safety climate on the basis of a representative sample of road users including all travel modes.

Validity characterises the credibility of a scientific concept, measurement or theory. There are different aspects which manifest themselves in different types of validity. The more aspects withstand scientific testing the more valid i.e. credible a measurement is. In this paper we analyse the construct validity and to a lesser extent the criterion validity of traffic safety climate. Construct validity can be determined by factor analysis among others. It shows how well the measurement reflects the underlying theoretical concept. In that sense it also contributes to development of the theoretical concept itself, since both are interrelated. Because the concept of traffic safety climate is mainly based on vehicle traffic so far it warrants further investigation for the road user population at large. Criterion validity describes the relationship between the measurement and some external criteria measured at the same time (concurrent validity) or some times after (predictive validity). Since road safety research and practice focuses on accident prevention a concept like traffic safety climate should predict road user behaviour and crash involvement. However, research demonstrates multiple influences on road user behaviour and crash involvement (Rumar, 1985). Thus as important as sheer outcome prediction seems to be the underlying mechanism of the relation between traffic safety climate and road user behaviour and crash involvement. This can be analysed with concurrent measurements.

Both types of validation require a sound theoretical framework. Since we define traffic safety climate as an attitude we draw on the large body of attitude theory. In particular we are focusing on attitudes structures and the relation between attitudes and behaviour. In the next section we briefly introduce these aspects of attitude theory. Furthermore, since empirical research on traffic safety climate is still in its still in its infancy we also draw the on extensive evidence organisational safety climate (Ostroff et al., 2013; Zohar, 2010). Especially relevant are studies on professional drivers since they combine safety climate and driver behaviour measures and thus could inform us about possible correlations between traffic safety climate and road safety outcomes. In the following we summarise the relevant evidence from organisational climate, organisational safety climate and traffic behaviour research. We sum up with hypotheses about the expected relation between traffic safety climate and traffic safety outcome variables.

Traffic safety climate research is mostly conducted using quantitative survey methods examining people's attitudes and behaviour and how these are categorised into analytical dimensions defined by the researchers (Guldenmund, 2000). We follow this path and use data from a large-scale German road safety survey (Gehlert & Genz, 2011). A German version of the Traffic Climate Scale (TCS) (Özkan & Lajunen, unpublished) was developed and applied. At the same time road user behaviour and accident involvement was measured. The survey is representative for household characteristics and travel mode choice in Germany, thus incorporating all travel modes.

2. Traffic safety climate as an attitude

Attitudes are commonly defined as a summary evaluation of an entity with some degree of favour or disfavor (Ajzen, 2001). They facilitate a person's adaptation to the environment for example by organising and interpreting new information or expressing central values and beliefs. In that sense traffic safety climate as an individual's attitude summarises information and expectations concerning traffic safety and helps to interpret traffic situations and/or interactions with other road users.

Attitudes consist of a cognitive, an affective and a behavioural component. The cognitive component contains thoughts and ideas that a person hold about the entity whereas the affective component consists of feelings and emotions towards that entity. The behavioural component contains overt behaviour as well as behavioural intentions towards that entity. Taken car driving as an example, people might think that he/she is a good driver (cognitive component) accompanied with positive feelings towards driving ("I like driving", affective component) and the intention to use the car for the next trip (behavioural component). Empirical research does not support the three component model in all domains, nor do people always respond to attitude entities with all three types of reactions. Rather, it is accepted as conceptual framework that illustrates the range of possible manifestations of attitudes (Eagly & Chaiken, 1993).

The Theory of Planned Behaviour describes in more detail how evaluations i.e. attitudes translate into behavioural intentions and actual behaviour. The main components are a person's attitude, subjective norms, perceived behavioural control, intentions, and behaviour (Ajzen, 1991, 2001). The theory predicts that an individual's behaviour is a direct function of the intention to perform that behaviour and perceived behavioural control accounting for internal and external constraints. Behavioural intention is determined by individual attitudes, subjective norms (the expectation how significant others perceive and evaluate own behaviour), and again perceived behavioural control. The theory applies to intentional behaviour with traffic behaviour being an example.

3. The structure of the traffic safety climate

Empirical evidence on the structure of traffic safety climate is sparse. But research on organisational climate and safety climate has produced a number of taxonomies and dimensions. For example, in a meta-analysis Carr, Schmidt, Ford, and

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